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SCIENTIFIC NOTE

Mass movements of *Nymphalis californica* (Boisduval) in the San Francisco Bay area during 1971 (Lepidoptera: Nymphalidae).—The California Tortoise Shell butterfly undergoes periodic or sporadic population outbreaks and mass movements which have been called migrations in the literature. The last time such an event took place in the San Francisco Bay area was in 1959-1960 when several aggregations of the butterflies were observed flying in spring and under bark in winter in Marin County, followed by tremendous populations developed in June the following season. During intervening years the species is scarce and may not be a continuous breeding resident here.

During October 1971, I observed movements of *N. californica* in the Berkeley Hills, Alameda County, at a site above the Caldecott Tunnel (about 1,400 feet elevation). On 5 October, a smoggy day with temperatures in the 80's °F., the butterflies passed to the southeast (along the axis of the hills) at a steady 2/minute on a 50 foot sighting line, between 11:45 and 12:05 p.m. (P.S.T.). Most flew 3-8 feet above the ground over the roadway which forms a corridor through the trees at this point; a few flew circuitously or eastward through the trees. However, on the open ridge east of the trees none could be seen heading eastward, that is off the ridge axis. 7 October was cooler (77° maximum in Oakland) with an easterly breeze. The *Nymphalis* were less numerous and less directional in their activities, with 45 sighted in aggregated 30 minutes surveillance between 11:50 and 12:40 p.m., and only 75% moved in a southeasterly or easterly direction. On 12 October, another warm, smoggy day (90° in Oakland), the flight was greatly increased, with a census of 392 during periods totaling 35 minutes (11/minute) between 11:30 and 12:15 p.m. Counts were made on the road and on open ridge knolls to the east and all individuals moved southeasterly despite a stiff northeasterly breeze. The site was revisited between 11:30 to 1:00 p.m. on 14 and 28 October, which were clear but much cooler days, and no *N. californica* were present.

Ten specimens were taken on 12 October and eight proved to be females, the ratio perhaps in part the result of sampling error if males are faster, more erratic fliers. Other butterflies flying in the vicinity included *Precis coenia* (Hübner), *Adelpha bredowi* (Geyer), *Vanessa carye* (Hübner), *Danaus plexippus* (L.), and *Colias eurytheme* (Boisduval). All but *P. coenia* were present in low numbers and none showed any tendency for directional movement.

Sightings of individual *N. californica* were made in Walnut Creek, Contra Costa County and in Berkeley on the University of California campus, during the period of 5-12 October, by John Hafernik. Both localities are non-resident sites for this species.—J. A. POWELL, *University of California, Berkeley, 94720.*